

REMARKS

Reconsideration and allowance in view of the foregoing amendment and the following remarks are respectfully requested.

Claims 12-15 and 21-37 remain pending. Applicants note with appreciation the Examiner's indication that claims 12-14 and 27-30 are allowed. It also appears that claim 15 and 31 would be allowable if amended to overcome the rejections under 35 U.S.C. § 112.

Claims 21-26, 31 and 36 were rejected under 35 U.S.C. § 112, first paragraph. This rejection is overcome in part by the foregoing amendments and is traversed in part.

The expression "said internal electrode has an emissivity less than 0.3" was rejected on the ground that it is allegedly without support in the original disclosure. In order to advance prosecution, claims 12 and 31 have been amended above to cancel this expression and insert in lieu thereof that the internal electrode material has a lower emissivity than the high-emissivity layer. This amended language is believed to be inherently supported in the specification by the denotation of the high-emissivity layer as having a high emissivity, and by the examples set forth in the specification.

The expression "said high-emissivity layer has a porosity of more than 10 percent" recited in the last two lines of claims 21 and 36 was also rejected on the ground that it is allegedly without support in the original disclosure. This ground of rejection is traversed. As set forth in the first paragraph on page 1 of the specification, the priority document is incorporated by reference. A copy of a certified translation of an excerpt from the priority document was submitted with the February 11, 1997 Amendment (which was requested for entry at numbered paragraph 13 of the April 11, 1997 FWC application). The excerpt shows that the claiming of a porosity of more than 10 percent is supported by the priority document,

and, therefore, is also supported by the original disclosure, which incorporates the priority document. Additionally, per amendments to the specification presented in the February 11, 1997 Amendment, page 3, line 7 of the specification has already been amended to provide literal antecedent basis for the rejected claim language.

For these reasons, reconsideration and withdrawal of the Section 112, first paragraph rejection are respectfully requested.

Claim 15 was rejected on the ground that the expression “said material having a high emissivity” is without antecedent basis.

In response, claim 15 has been amended in accordance with the Examiner’s constructive suggestion. It is respectfully submitted that all claims are in compliance with Section 112, and withdrawal of this rejection is, therefore, respectfully requested.

Claims 21-23, 36 and 37 were rejected under 35 U.S.C. § 103 as unpatentable over U.S. Patent No. 4,540,479 to Sakurai et al. in view of U.S. Patent No. 4,452,687 to Torisu et al. and U.S. Patent No. 4,021,326 to Pollner et al. Applicants respectfully traverse this rejection.

Independent claims 21 and 36 recite that the high-emissivity layer provided on a surface of the internal electrode has a porosity of more than 10 percent.

Both Sakurai and Torisu et al., when taken alone or in combination, fail to teach or reasonably suggest an acceptable porosity for its alleged high-emissivity layer formed on the internal electrode.

To overcome this deficiency, the Examiner points to Pollner et al., which allegedly discloses an external electrode protective layer having a porosity of 1-50%. However, Pollner

et al. is devoid of any teaching or reasonable suggestion that its external electrode protective layer may be used on the surface of an internal electrode.

The absence of any teaching in Pollner et al. that its external electrode protective layer may be used to protect an internal electrode is not surprising, since protective layers for protecting internal electrodes serve different functions than those for protecting external electrodes. External electrode protective layers, such as the one disclosed in Pollner et al., are generally used for preventing liquid-like impurities contained in exhaust gas from adhering on the external electrode. By contrast, as described in JP-A-215059 (attached hereto with English abstract), protective layers placed on internal electrodes do not protect the internal electrode from exhaust gas; rather, internal electrode protective layers prevent sensor output from being decreased by silicon gas (generated from silicon components are found in the air), which adheres to and poisons the internal electrode. It is understood in the art that such poison-preventing layers require a fine porosity to effectively block the silicon gas from reaching the internal electrode. Thus, the internal electrode protective layer would need a porosity smaller than 10% to function effectively.

JP 1-77946 and JP 2-287251 (attached hereto with IDS), when taken in combination, further support Applicants' contention that internal electrode protective layers have porosities smaller than 10%. JP '946 describes an oxygen sensor having an internal electrode (2) and an external electrode (3), shown in Figures 1(a) and 1(b). As shown in Figure 1(b), an inner protective layer (5) is formed on an inner surface of the internal electrode (2). The inner protective layer (5) is mainly composed of heat-resistant oxide such as SiO_2 , and is formed into a glass-like structure in which its **atomic** arrangement has a retinal structure. Further, JP

'946 teaches treating its SiO₂ protective layer at 1500°C, which would produce a structure having a fine porosity.

JP 2-287,251 discloses a conventional gas expansion layer covering the entire outer surface of an external electrode has a porosity ranging from 5-10%. JP '251 further teaches at page 3 that where the gas expansion layer is formed from SiO₂ glass, the porosity is even smaller.

For these reasons, it is respectfully submitted that the Section 103(a) rejection of claims 21 and 36, and claims 22 and 23, which depend therefrom, is misplaced.¹ Therefore, reconsideration and withdrawal are respectfully requested.

Claims 21-26 and 36 were rejected under 35 U.S.C. § 103(a) over Torisu et al. in view of Sakurai et al., U.S. Patent No. 4,212,720 to Maurer et al. or U.S. Patent No. 4,900,412 to Ker et al., and Pollner et al. This rejection is traversed.

As discussed above, Torisu et al., Sakurai et al., and Pollner et al., when taken alone or in any combination, fail to teach or reasonably suggest an internal electrode protective layer having a porosity of more than 10%. Maurer et al. and Ker et al., which were cited as allegedly disclosing locating a heater within a solid electrolyte element, do not overcome this deficiency.

For this reason, reconsideration and withdrawal of the Section 103(a) rejection of claims 21-26 and 36 are respectfully requested.

¹ Claim 37 depends from claim 32, which is not subject to this rejection. It is, therefore, respectfully submitted that this rejection was improperly asserted against claim 32.

Finally, claims 32-35 and 37 were rejected under 35 U.S.C. § 103(a) as unpatentable over Ker et al. in view of U.S. Patent No. 4,935,118 to Agarwal et al. This rejection is respectfully traversed.

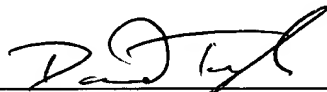
Ker discloses a heater adjacent to an inner electrode, and Agarwal discloses a heater made of SiN, AlN and SiC. However, in amended claim 32, the heater itself has an emissivity of 0.6 or more to effectively transmit heat from the heater to the solid electrolyte without heat accumulation. That is, in the present invention, to solve the problem of the heat accumulation of the heater disposed within the solid electrolyte, the high-emissivity layer is provided on the outer surface of the heater or is the heater itself. Ker does not disclose the problem of heat accumulation, and does not disclose a heater having a high emissivity itself. In Agarwal, because the heater is disposed around the solid electrolyte, there is no problem of heat accumulation either.

Thus, even if the teachings of Ker and Agarwal could be combined, claims 32-35 are not obvious.

All objections and rejections having been addressed it is respectfully submitted that the present application is in condition for allowance and a Notice to that effect is solicited.

Respectfully submitted,

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